

A New Population of Aleutian Shield Fern (*Polystichum aleuticum* C. Christens.) on Adak Island, Alaska

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ABSTRACT.—We report and describe a new population of the endangered Aleutian shield fern (*Polystichum aleuticum* C. Christens.) discovered on Mount Reed, Adak Island, Alaska. The new population is located at a lower elevation than the other known populations, placing the species' known elevational range between 338 m and 525 m. The discovery of this population is significant because it increases the total number of known populations and individuals for the species.

The Aleutian shield fern, *Polystichum aleuticum* C. Christens., is one of the most restricted and rare ferns in North America (Smith, 1985); it is listed as an endangered species (U.S. Department of Interior, 1988). In a circumpolar assessment of the rare vascular plants of the Arctic, the fern was classified according to the IUCN Red List threat categories as “endangered” (Talbot *et al.*, 1999). The species was first collected by W. J. Eyerdam, an assistant to Eric Hultén, in 1932 on Atka Island, one of the Andreonof Islands located in the center of the Aleutian Island chain, Alaska (Fig. 1). Eyerdam's holotype specimen (*W. J. Eyerdam 1086*, 5 July 1932) is accessioned at S; isotypes are accessioned at CAS, DS, and US. The species was first described by Christensen (1938). Attempts to relocate the original collection site on Atka in years subsequent to the species' description were unsuccessful (Smith and Davison, 1988). Then, in 1975, a population of the species was discovered, this time on the northeast arm of Mt. Reed, on Adak Island (Fig. 1), also of the Andreonof Islands of the Aleutian Island chain, Alaska (Smith, 1985). Several subsequent searches, performed from 1986 to 1988, on various islands of the Aleutian Island chain (Adak, Kagalaska, Atka and Attu; see Talbot *et al.*, 1995 for review) failed to locate additional populations. Finally, in 1988 and 1993, we discovered a second and third population, respectively, again on Mt. Reed (Talbot *et al.*, 1995). Three populations comprising approximately 117 individual fern clumps are known for the species (Tande, 1989; Talbot *et al.*, 1995).

In August 1999, genetic studies of *Polystichum aleuticum* were initiated to assess the species' relationship to *P. lachenense* (Hook.) Bedd. of Asia, as recommended in Talbot *et al.* (1995). While collecting samples as part of this genetic research, as well as ongoing systematic monitoring of the three known populations (Anderson, 1992), we discovered a fourth population of *P. aleuticum*, located approximately 142 m below the two populations found on

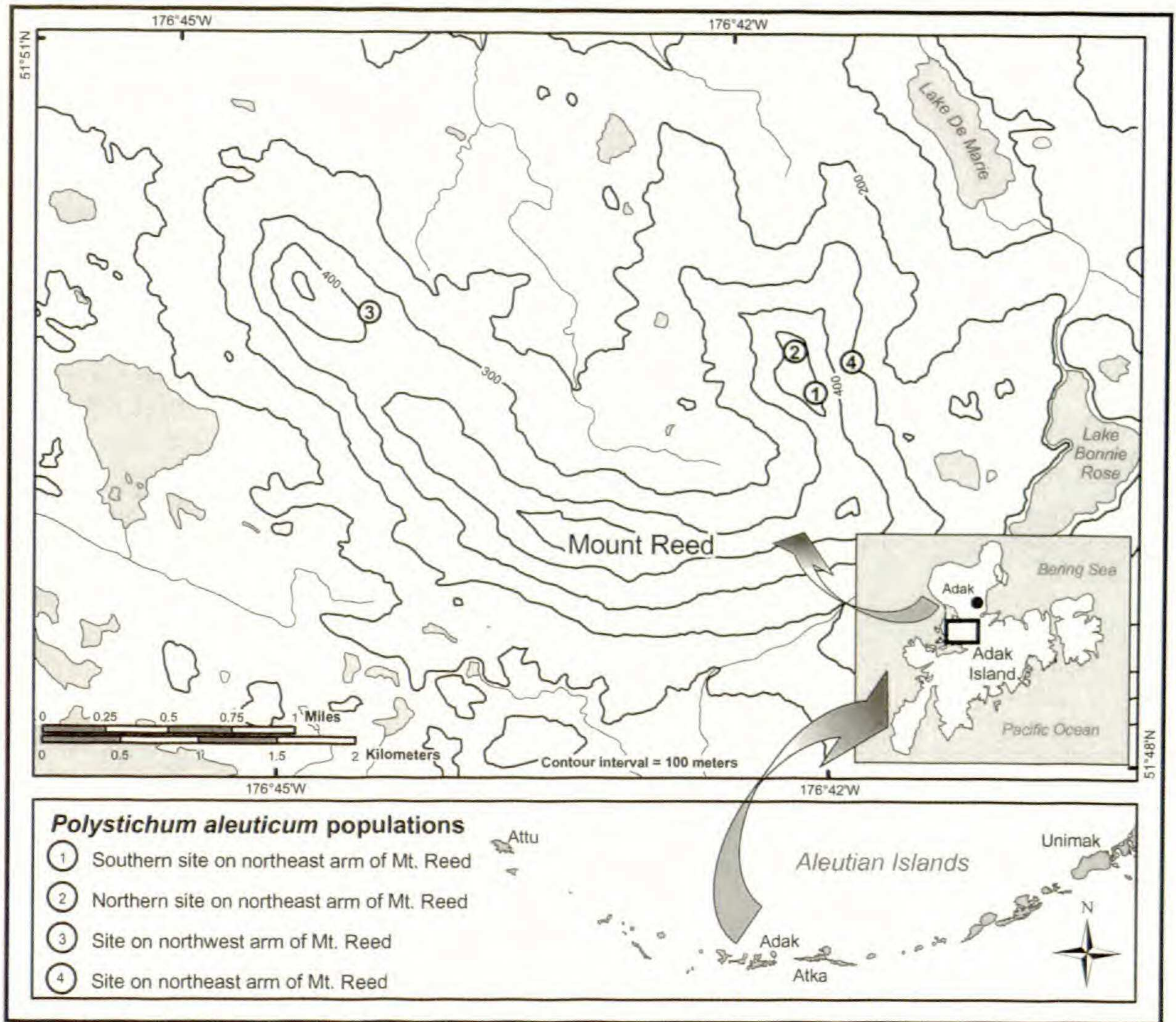


FIG. 1. Location of the four known populations of the Aleutian shield fern, *Polystichum aleuticum*, on Mt. Reed, Adak Island, Aleutian Islands, Alaska.

the northeast arm of Mt. Reed, Adak Island, at an elevation of 338 m. As was the case for the other three sites found on Mt. Reed, the fourth site was at the base of a steep rock outcrop on a northeast-facing slope. The slope angles at this site ranged from 60° to 90°. Notably, the site is located approximately 22 m below the lowest of the three previous populations (Population 3, Fig. 1, Table 1), in an area considered too treacherous to survey during earlier efforts due to steep, unstable, slippery slopes. This finding expands the elevational range of *P. aleuticum*, placing the species at elevations between 338 m and 525 m (Table 1). Also, notably, the fourth site is located on a northeast-facing slope. Climatologic records based on observations from 1950 to 1982 indicate wind direction on Adak is predominantly from the west-southwest, averaging 10.5 knots per hour, from June to November, the period of time during which the habitat would likely be free of snow (U.S. Department of the Navy, 1989). Thus, the occurrence of all known populations on northeast-facing

TABLE 1. Population characteristics of *Polystichum aleuticum* and associated geographical variables.

Island	Location	Pop. #	Latitude/ Longitude	Elevation (m)	Aspect	# Individuals	Year	Relocated
Atka	unknown, "within view of the village of Atka" ¹		unknown	unknown	unknown	unknown very rare	1932 ¹	N
Adak	Mt. Reed, NE Arm	1	51° 49.640' N 176° 41.861' W	475.5–525.8	NE	98	1975 ²	Y
Adak	Mt. Reed, NE Arm	2	51° 49.491' N 176° 41.776' W	457.2–469.4	NE	14	1988 ³	Y
Adak	Mt. Reed, NW Arm	3	51° 49.960' N 176° 44.141' W	360.4	NE	5	1993 ³	Y
Adak	Mt. Reed, NE Arm	4	51° 49.378' N 176° 41.733' W	338.0	NE	14+	1999 ⁴	Y

¹ Christensen (1938).² Smith (1985).³ Talbot *et al.* (1995).⁴ Present study.

slopes suggests habitats supporting populations of *P. aleuticum* are those offering protection from high winds during critical growth and reproductive periods.

At least 14 clumps constituted the new population; however, due to the inaccessibility of some of the vertical rock faces, a complete count of individual clumps was not possible. This number therefore underestimates the size of the population. Among the 14 clumps counted, five are associated with rock grottos; the remaining clumps are found on ledges on steep rock faces. Unlike the other locales, no clumps were associated with herb meadows. Clumps in the grottos and ledges comprise from five to 30 fronds, with all clumps containing fronds with sori. Clumps associated with steep rock faces comprise 12–40 fronds, again with all clumps examined containing fronds with sori. However, for safety reasons, not all clumps on vertical rock faces were examined to determine the number of fronds or presence of sori. The presence of sori on some *P. aleuticum* fronds suggests this population may be useful if spores were used for controlled propagation.

We recorded vascular plants associated with the new population; nomenclature follows USDA, NRCS (2001). Vascular plants associated with grotto and ledge clumps were the creeping dwarf shrub *Salix rotundifolia* Trautv.; the forbs *Achillea millefolium* L. var. *borealis* (Bong.) Farw., *Anemone narcissiflora* L., *Arnica unalaschcensis* Less., *Campanula lasiocarpa* Cham., *Conioselinum gmelinii* (Cham. & Schlecht.) Steud., *Huperzia chinensis* (Christ) Czern., *Lycopodium alpinum* L., *Pedicularis verticillata* L., *Platanthera* sp. L. C. Rich., *Polygonum viviparum* L., *Polystichum lonchitis* (L.) Roth, *Potentilla villosa* Pallas ex Pursh, and *Valeriana acutiloba* Rydb.; and the graminoids *Carex macrochaeta* C. A. Mey., *Carex circinata* C. A. Mey., *Poa* sp. (L.) Roth (viviparous) and *Tofieldia coccinea* Richards. Vascular plants associated with vertical rock faces included the forbs *Achillea millefolium* var. *borealis*, *Epilobium hornemannii* Reichenb., and *Viola langsдорфii* Fisch. ex Gingins; and the graminoids *Carex circinata*, *Poa* sp. (viviparous) and *Tofieldia coccinea*. Comparison of this list of associates from the other sites (Lipkin, 1985; Talbot *et al.*, 1995) indicates a high degree of similarity in species composition among the four known populations.

Using a hand-held Global Positioning System, we recorded precise geographic coordinates for this population as 51° 49.578' N, 176° 41.733' W. The discovery of this new population increases the number of known individuals to 131. We note here that this population was discovered accidentally while we were disoriented in the fog on Adak, and the area would, under normal circumstances, have been considered too treacherous to survey. It is very possible that additional populations of *P. aleuticum* inhabit Mt. Reed or nearby mountains, in areas too dangerous to survey without risk of injury, and we suggest the number of individuals representing *P. aleuticum* on Adak is likely underestimated, despite extensive surveys undertaken throughout the island from the mid-1980s to the mid-1990s.

This discovery is significant because it increases the number of known individuals by approximately 12%, and the number of known populations

from three to four, thus providing an increased buffer against loss of either individuals or populations of this rare and endangered species. It also expands the known elevational range within which future searches for new populations should be targeted.

Despite this new finding on Adak, however, *P. aleuticum* continues to be one of the rarest ferns in North America. While conducting botanical studies on other Aleutian islands between 1985 to 2001, the second author searched rocky outcrops similar to those on Adak that support the four known populations, without finding any new populations. These islands include: Adugak, Aiktak, Amlia, Buldir, Chagulak, Davidof, Kasatochi, Khvostof, Kiska, Nizki, and Uliaga islands. Additional surveys by both authors of Attu Island in 2000 and Simeonof Island of the Shumagin Island group, eastern Aleutians, in 1997 also failed to yield discoveries of new populations. Thus, biologists have searched for *P. aleuticum* on 16 islands in the Aleutian chain during the past fifteen years, and have found the fern only on the northern slopes of Mt. Reed, Adak Island.

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